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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
VOLKER HENNIGE, ET AL.	: EXAMINER: COLE, E. M.
SERIAL NO: 10/501,713	:
FILED: JULY 19, 2004	: GROUP ART UNIT: 1794
FOR: CERAMIC MEMBRANE BASED ON A SUBSTRATE CONTAINING POLYMER OR NATURAL FIBRES, METHOD FOR THE PRODUCTION AND USE THEREOF	:

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Responsive to the Office Action of June 3, 2008, and the final Office Action of December 17, 2007, Appellants request review of the rejection of the present claims by the Board of Patent Appeals and Interferences.

I. REAL PARTY IN INTEREST

The real party in interest is Degussa AG of Duesseldorf, Germany.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF THE CLAIMS

Claims 1, 3-12, 14-22, 24-28, 30-38, 40 and 46-48 are active in the present application. Claims 2, 13, 23, 29, 39 and 41-45 are canceled claims. The rejection of Claims 1, 3-12, 14-22, 24-28, 30-38, 40, and 46-48 is appealed.

IV. STATUS OF AMENDMENTS

The amendment filed on April 17, 2008 was entered and considered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent Claim 1 is drawn to a membrane that comprises a sheetlike flexible substrate with openings and a porous coating present thereon and therein. The substrate is described on page 6, lines 1-22. The coating present on and in the substrate is described on page 7, lines 26-30. The substrate is a nonwoven polymeric fiber made of particular polymeric materials. The polymeric materials are disclosed on page 6, line 35 - page 7, line 4. The substrate has a porosity of greater than 50% and a thickness of 10-200 μm. The porosity of the substrate is described on page 6, lines 1-22 and page 6, lines 24-33. The coating composition including an adhesion promoter is disclosed on page 7, line 32 through page 8, line 5. The coating comprises an adhesion promoter that must be at least one of a glycidyloxy-functionalized silane and/or a methacryloyloxy-functionalized silane. The adhesion promoter is described on page 15, line 15 through page 16, line 31.

Claim 32 requires the polymeric fiber of the substrate to be a polyacrylonitrile fiber. The polymeric fibers of the substrate are described in the paragraph bridging pages 15 and 16.

Claim 33 requires the polymeric fiber of the substrate to be a polyamide fiber. The polymeric materials that may be the fibers of the substrate are described in the paragraph bridging pages 15 and 16.

Claim 34 requires that the polymeric fiber of the substrate is a polyimide fiber. The polymeric materials of the fiber of the substrate are described in the paragraph bridging pages 15 and 16.

Claim 35 requires that the polymeric fiber of the substrate is a polyacrylate fiber. The polymeric materials of the fibrous substrate are described in the paragraph bridging pages 15 and 16.

Claim 36 requires that the polymeric fiber is polytetrafluoroethylene. The polymeric materials that may make up the polymeric fiber are described in the paragraph bridging pages 15 and 16.

Claim 37 requires that the polymeric fiber is a polyester fiber. The fibers that may be the polymeric fibers of the substrate are described in the paragraph bridging pages 15 and 16.

Claim 38 requires that the polymeric fiber is a polyolefin fiber. The fibers of the substrate are described in the paragraph bridging pages 15 and 16.

Claim 40 requires that the adhesion promoter is one of 3-glycidyloxytrimethoxysilane and 3-meth-acryloyloxypropyltrimethoxysilane. The adhesion promoter is described in the paragraph bridging pages 15 and 16.

Claim 47 requires that the adhesion promoter is a glycidyloxy-functionalized silane. The adhesion promoter recited in the claims is described in the paragraph bridging pages 15 and 16.

Claim 48 requires that the adhesion promoter is a methacryloyloxy-functionalized silane. The adhesion promoter of the invention is described in the paragraph bridging pages 15 and 16.

VI. GROUNDS OF REJECTION

A. Claims 1, 3-12, 14-22, 24-28, 30-31, 33, 40, and 46-48 are rejected as obvious under the meaning 35 U.S.C. § 103(a) over Penth (U.S. 6,309,545) in combination with Guiver (U.S. 2002/0062737), Silane

Coupling Agents (pp. 31-32 and 153), and Inorganic Polymer Engineering Materials.

The Office cites Penth for disclosure of a fibrous substrate that may comprise a coating of metal oxides. The Office relies on Guiver for a teaching of using adhesion promoters in order to promote adhesion between a polymeric substrate and an inorganic coating. The Office relies on Silane Coupling Agents and Inorganic Polymer Engineering Materials as a teaching of the silane coupling agents recited in Claim 1.

B. Claims 32 and 34-38 are rejected as obvious under the meaning 35 U.S.C. § 103(a) over Penth in combination with Guiver, Silane Coupling Agents, Inorganic Polymer Engineering Materials, and Sassa (U.S. 5,324,579).

The Office relies on Sassa for a teaching that certain polymeric materials may be used to form filter materials.

C. Claims 1, 3-12, 14-22, 24-28, 30-38, 40, and 46-48 are rejected under the judicially created doctrine of obviousness-type double patenting over co-pending applications 10/504,144; 10/524,143; 10/524,669; 10/519,097; 10/575,268; 10/575,759; and 10/575,734.

The Office combines Guiver with the claims of the aforementioned co-pending applications as a basis for asserting that the present claims are obvious in view of the claims of the co-pending applications because Guiver teaches employing an adhesion promoter to promote adhesion between a polymeric substrate and an inorganic coating. See paragraph no. 5 on page 3 of the June 3, 2008 Office Action.

VII. ARGUMENT

A. The Office failed to set forth a *prima facie* case of obviousness with respect to the rejection of the claims as obvious over Penth, Guiver, Silane Coupling Agents, and Inorganic Polymer Engineering Materials.

Present Claim 1 is drawn to a membrane that comprises a porous nonwoven polymer fiber substrate having a coating of porous ceramic material present on and in the substrate. The coating that is present on and in the substrate comprises an adhesion promoter that must be one of a glycidyloxy-functionalized silane and a methacryloyloxy-functionalized silane.

The Office first relies on Penth as evidence that permeable fibrous substrates having a coating are known. The Office concedes that Penth does not describe the use of an adhesion promoter in a coating present on a fibrous substrate (see the paragraph bridging pages 6 and 7 of the June 3, 2008 Office Action). The Office relies on Guiver as evidence that it would be obvious to include an adhesion promoter in an inorganic coating present in and on a fibrous substrate.

(1) A first reason why the rejection is improper is the fact that the disclosure of Guiver is limited to the use of a certain adhesion promoter (i.e., an amino functional methoxysilane) to bind zeolite particles to an aldehyde-modified polysulfone polymer. Guiver does not disclose that such binding can take place between a ceramic coating and any of the polyacrylonitrile, polyamide, polyimide, polyacrylate, polytetrafluoroethylene, polyester, or polyolefin fibers recited in present Claim 1.

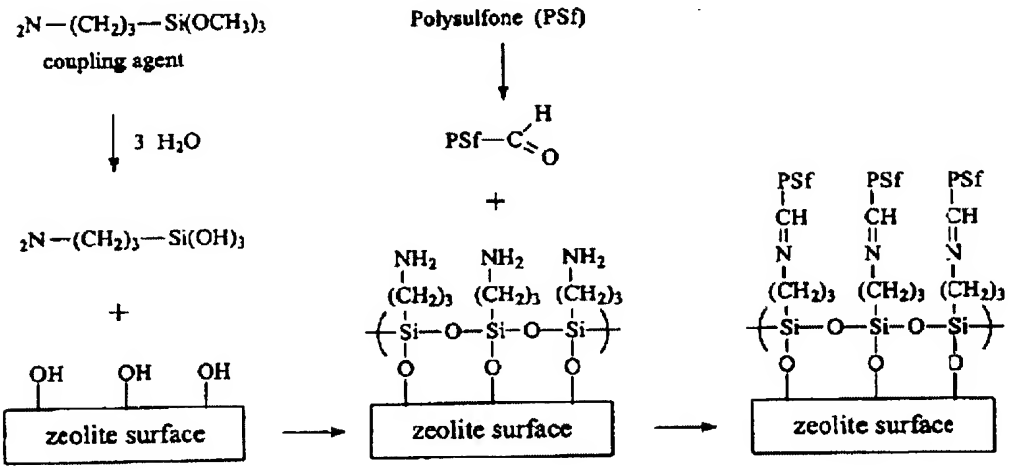
Guiver discloses the use of a particular amino functional methoxysilane to bind zeolite particles to modified polysulfone. Polysulfone is not one of the polymer fibers recited in present Claim 1. There is suggestion put forth by Guiver that an amino functional methoxysilane (e.g., a compound which the Office appears to assert is an adhesion promoter) may be used to improve adhesion between ceramic materials and other types of polymers. In fact, Guiver makes it clear that the improved adhesion disclosed in the Guiver publication is

due to a particular reaction that occurs between the amino functional methoxysilane and acyl groups present on the modified polysulfone. Guiver discloses the following in this regard:

> In order to enhance the membrane selectivity, the inventors provide a method for covalently attaching zeolite particules to the polymer chain, thereby reducing or eliminating the presence of void spaces between the two phases. This is achieved using an aminofunctional methoxysilane as a coupling agent to bind the zeolite particles to an aldehyde modified polysulfone matrix. It is believed that the aldehyde functional group of the polymer reacts with the amino group of the coupling agent which itself binds to the zeolite surface by reaction of silyl ether with zeolite-OH as shown in the reaction scheme of FIG. 1....

See paragraph [0010] on page 2 of Guiver.

Figure 1, reproduced below, shows that the coupling agent binds to the polysulfone by reaction of an acyl group present on the polysulfone with the amino groups of the amino functional methoxysilane.



Appellants argued this point in an Amendment filed on August 3, 2007 (see pages 10-11 of the August 3, 2007 Amendment). The Office responded to Appellants' August 3, 2007 arguments by stating:

> However, Guiver does teach that employing an adhesion promoter enhances bonding between polymeric substrates and inorganic coatings and therefore, the person of ordinary skill in the art would have been motivated to employ the known adhesion promoter of Guiver for its known purpose

> of promoting adhesion between a polymeric substrate such as those taught in Penth and an inorganic coating.

See page 11 of the final Office Action of October 10, 2007.

The Office's response to Appellants' arguments of August 3, 2007 fail to provide any reason why one of ordinary skill in the art would believe that the amino functional methoxysilane disclosed in Guiver would provide any adhesion promoting when used with the polymers recited in present Claim 1.

Guiver discloses that the bonding between zeolite and polymer is effected by an amino functional methoxysilane that covalently bonds both the zeolite surface and the polysulfone. The covalent bonding between the amino functional methoxysilane and the polysulfone is possible due to reaction between an acyl group present on the polysulfone and amino groups present on the amino functional methoxysilane bonded to the zeolite surface. The Office has not demonstrated, and in fact cannot demonstrate, that a similar reaction takes place between the amino functional methoxysilane of Guiver and any one of the polymers recited in the present claims.

In short, the Office failed to establish any link between the adhesion effects of the amino functional methoxysilane/polysulfone combination disclosed in Guiver and the use of an adhesion promoter in a ceramic coating to bond the coating to the polymeric fibers recited in the present claims.

The subject matter of dependent Claims 32-38 is likewise patentable over the art cited by the Office. The Office has not demonstrated that the amino functional methoxysilane of Guiver can in any way function as a coupling agent by, e.g., covalently bonding zeolite particles to any of the polymers of Claims 32-38 (i.e., polyacrylonitrile, polyamide, polyimide, polyacrylate, polytetrafluoroethylene, polyester and polyolefin, respectively).

Further, the Office failed to put forth any reason why the particular adhesion promoters recited in the present claims, i.e., glycidyloxy-functionalized and

methacryloyloxy-functionalized silanes, could function in the manner disclosed in Guiver (i.e., by forming covalent bond linkages between a zeolite surface and a polysulfone).

Appellants thus submit that the Office has failed to set forth a *prima facie* case of obviousness of the present claims over Penth combined with Guiver, optionally with other art, for the reason that the mechanism of coupling of Guiver is not applicable to the polymeric fibers recited in the present claims.

(2) As a second reason why the rejection of the claims as obvious over the cited art is not supportable, Appellants point out that the structures of the Penth and Guiver materials is substantially different. In fact, Penth discloses a structure that is the inverse of the structure of the Guiver materials and the other cited art. For example, Penth discloses a permeable composite material made from a permeable porous support that may include polymeric fibers. In Penth the polymeric fibers are coated with metallic compounds. On the other hand, Guiver discloses zeolite particles that are coated with a polymer. This is evident from the examples of Guiver which describe the preparation of a membrane by first suspending zeolite in solution with an amino functional methoxysilane then coating the amino functionalized methoxysilane with a polysulfone polymer (see paragraph [0023] on pages 2 and 3 of Guiver).

The presently claimed membrane must have a structure wherein polymeric fibers are coated with a ceramic material. To the contrary, Guiver discloses a substrate, i.e., zeolite particles, that are coated with a polymeric material. The Office has given this difference between the references no weight in judging the appropriateness of the rejection.

The same structural contradiction exists between the structure of the Penth permeable composite material and the structures disclosed in Silane Coupling Agents and Inorganic Polymer Engineering Materials. Silane Coupling Agents discloses the use of organofunctional silanes to bond materials to glass fibers (see page 153 of Silane Coupling

Agents). Inorganic Polymer Engineering Materials likewise discloses treating a glass fiber with an alkoxy silane and immersing the treated glass fiber in a polymer.

The structures derived from the teachings of each of Guiver, Silane Coupling Agents, and Inorganic Polymer Engineering Materials yield materials having inorganic cores (e.g., a zeolite particle or a glass fiber) that are completely coated with a second material such as a polymer. The structure of the membrane of the presently claimed invention is exactly the opposite; namely, a core of polymeric material on which a coating of ceramic material is present.

The Office makes no attempt to explain how the contradictory structures of the membranes described in the cited art can suggest the presently claimed invention. The Office likewise makes no attempt to explain why one of ordinary skill in the art would believe that an adhesion promoter could function in the same way in such different structures.

For this further reason, Appellants submit that the Office has failed to set forth a *prima facie* case of obviousness and the rejection should be overturned.

(3) The rejection of the claims is further not supportable for a third reason, Appellants submit that the art of record teaches away from the presently claimed invention and thus the Office's assertion of *prima facie* obviousness cannot stand.

Present Claim 1 requires that the adhesion promoter present in the coating is at least one of a glycidyloxy-functionalized silane and a methacryloyloxy-functionalized silane. The Office acknowledges that neither Penth nor Guiver disclose either of the adhesion promoters required to be present in the claimed invention (see paragraph no. 14 on page 9 of the June 3, 2008 Office Action). The Office relies on Silane Coupling Agents and Inorganic Polymer Engineering Materials to cure this deficiency of the cited art. In particular, the Office cites to page 21 of Inorganic Polymer Engineering Materials as evidence that it is known to use a glycidyloxytrimethoxysilane as a silane coupling agent. Appellants note that no such

disclosure appears on page 21 of the cited art. On page 15 of Inorganic Polymer Engineering Materials the use of 3-glycidyloxytrimethoxysilaneto treat a glass fiber which is subsequently mixed and encapsulated in a polymeric material is described. As already pointed out above, this structure is exactly opposite of the structure of the membrane of the present claims. The contradictory disclosure improperly forms a foundation for the Office's rejection.

Appellants submit that the disclosure on page 15 of Inorganic Polymer Engineering Materials in fact is supportive of the patentability of the presently claimed invention. The disclosure of Inorganic Polymer Engineering Materials shows that one of ordinary skill in the art would not have been led to use the silane coupling agent glycidyloxytrimethoxysilane as an adhesion promoter:

> It is surprising that the glass fiber filled bars have lower flexural strength than bars with some of the other fillers. Factors that might affect this result are the aspect ratios of the fillers, adhesion to the fillers, and stiffness of the fillers.

See page 15, last sentence of the first full paragraph of Inorganic Polymer Engineering Materials.

The above-quoted disclosure of the cited art shows that those of ordinary skill in the art would be led to believe that using a treated glass fiber, i.e., a glass fiber treated with 3-glycidyloxytrimethoxysilane, would lead to **poor** adhesion of the glass fiber to the polymer material matrix. Thus, Inorganic Polymer Engineering Materials actually teaches away from the presently claimed invention and does not suggest the presently claimed invention, alone or in combination with the other art cited by the Office.

Moreover, contrary to the Office's assertion, Inorganic Polymer Engineering Materials does not disclose the use of a methacryloyl-functionalized silane. Present dependent Claim 48 explicitly states that the adhesion promoter is a methacryloyloxy-functionalized silane. In view of the fact that the cited art does not disclose the adhesion promoter of Claim 48, the cited art cannot disclose or suggest the claimed subject matter.

Silane Coupling Agents also teaches away from the presently claimed invention. In fact, Silane Coupling Agents would dissuade one of ordinary skill in the art from using either a glycidyloxy-functionalized or methacryloyloxy-functionalized silane as an adhesion promoter. Such dissuasion is evidenced by an explicit teaching away in the cited reference (underlining added):

> Organofunctional groups attached to silicon through alkoxy or acyloxy linkages generally do not have sufficient hydrolytic stability to provide environmentally stable bonds between resin and reinforcement. Thus, allyoxysilanes or silanes with glycidoxy or methacryloxy substituents on silicon are not useful as coupling agents.

See the last sentence in the third full paragraph on page 31 of Silane Coupling Agents.

Appellants submit that Silane Coupling Agents teaches those of ordinary skill in the art that glycidoxy- and methacryloyloxy-functionalized silicon substituents are not favorable materials to form stable bonds between resin and reinforcement. Appellants submit that this teaching away is probative of the patentability of the presently claimed invention and thus the rejection should be overturned.

The Office cites to the next paragraph on page 31 of Silane Coupling Agents as evidence of obviousness. This paragraph of the cited reference is reproduced below for convenience.

> An exception may be found in functional alkoxysilanes having a negative substituent on the second carbon of the alkoxy group. Reaction products of glycidyl methacrylate with chlorosilanes contain a $SiOCH_2CHClCH_2Y$ (Y = methacryloxy) linkage that contributes very creditable water resistance to reinforced polyesters. Comparable compounds of germanium, tin, titanium, and zirconium were much less effective as coupling agents.

At best, the above-quoted disclosure may be relevant to a reinforced polyester but does not suggest that methacryloyloxy-functionalized silanes can be used to improve adhesion between ceramic coatings and any of the fibers of dependent Claims 32-36 and 38

which recite polyacrylonitrile, polyamide, polyimide, polyacrylate, polytetrafluoroethylene, and polyolefin fibers, respectively.

B. The Office failed to set forth a *prima facie* case of obviousness with respect to the rejection of Claims 32 and 34-38 as obvious over Penth, Guiver, Silane Coupling Agents, Inorganic Polymer Engineering Materials, and Sassa.

The Office asserts that Claims 32 and 34-38 which recite particular polymeric materials are obvious over the combination of Penth, Guiver, Silane Coupling Agents, and Inorganic Polymer Engineering Materials, further in combination with Sassa. The Office asserts that because Sassa discloses that certain polymeric materials may be present in membranes used for filtration, that the inclusion of such polymeric fibers in the inventions of Penth is obvious.

Appellants submit that the subject matter of Claims 32 and 34-38 is patentable over the combination of Penth and Guiver for the reasons discussed above for Claims 1, 3-12, 14-22, 24-28, 30-31, 33, 40, and 46-48. The Office's citing to Sassa as disclosure for particular polymeric fibers used in filtration membranes represents nothing more than hindsight reasoning.

C. The rejection of the claims under the judicially created doctrine of obviousness-type double patenting should be withdrawn because those of ordinary skill in the art would not turn to Guiver to modify the presently-claimed invention.

As already explained above, Guiver discloses a structure that is substantially different from the structure of the present claims. For example, Guiver discloses a structure wherein a core of inorganic material such as a zeolite particle is immersed or surrounded by a matrix of a polymeric material. In contrast, the presently claimed invention includes a core of polymeric fibers coated with a ceramic material.

Although the Office asserts that Guiver discloses the use of an adhesion promoter in order to promote adhesion between a polymeric substrate and an inorganic coating, Appellants point out that Guiver actually discloses the opposite; namely, the use of an amino functionalized trimethoxysilane to coat a zeolite particle and not the use of an adhesion promoter to coat a polymeric fiber with a ceramic coating. Guiver discloses a structure that is completely incompatible with the structure of the claims of the co-pending applications.

Further, the Office provides no reason why one of ordinary skill in the art would believe that a ceramic coating could be adhered to a polymeric fiber by including an adhesion promoter when only a portion of the ceramic material is in contact with the polymeric fiber.

Moreover, even if the Office's reliance on Guiver in support of the obviousness-type double patenting rejection were correct, which Appellants submit is not the case, the Office's assertion that the claims of the co-pending applications and Guiver "set forth the claimed adhesion promoter" is not correct because the claims of the co-pending applications and Guiver do not disclose the glycidyloxy-functionalized and methacryloyloxy-functionalized silanes recited in Claim 1.

The rejection of the claims under obviousness-type double patenting should therefore be overturned.

As discussed above in detail Appellants respectfully request the Board to overturn the rejections of record.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

Claim 1 (Previously Presented): A membrane, comprising:

a sheetlike flexible substrate having a multiplicity of openings and having a porous coating on and in said substrate, said coating comprising an adhesion promoter and one or more inorganic components,

wherein the material of said substrate is a nonwoven polymeric fiber selected from the group consisting of a poly-acrylonitrile fiber, a polyamide fiber, a polyimide fiber, a poly-acrylate fiber, a polytetrafluoroethylene fiber, a polyester fiber, a polyolefin fiber and mixtures thereof, said material having a porosity of more than 50%, said substrate being from 10 to 200 μm in thickness and said coating being a porous ceramic coating,

wherein the adhesion promoter is at least one of a glycidyloxy-functionalized silane and a methacryloyloxy-functionalized silane.

Claim 2 (Canceled).

Claim 3 (Previously Presented): The membrane of claim 1, wherein said nonwoven includes said polymeric fiber, which is from 1 to 25 μm in diameter.

Claim 4 (Previously Presented): The membrane of claim 1, wherein the porosity of said substrate is in the range from 50 to 97%.

Claim 5 (Previously Presented): The membrane of claim 1, wherein said coating on and in said substrate comprises an oxide of a metal selected from the group consisting of Al, Zr, Si, Ti, Y and mixtures thereof.

Claim 6 (Previously Presented): The membrane of claim 1, wherein the porosity of said membrane is in the range from 10 to 70%.

Claim 7 (Previously Presented): The membrane of claim 1, wherein said membrane has an average pore size in the range of from 10 to 2000 nm.

Claim 8 (Previously Presented): The membrane of claim 1, wherein said membrane has a tensile strength of more than 1 N/cm.

Claim 9 (Previously Presented): The membrane of claim 1, wherein said membrane is bendable around a radius down to 100 mm without damage.

Claim 10 (Previously Presented): The membrane of claim 1, wherein said membrane is bendable around a radius down to 2 mm without damage.

Claim 11 (Previously Presented): A process for producing a membrane as claimed in claim 1 comprising providing a substrate from 10 to 200 μm in thickness, selected from the group consisting of nonwovens of polymeric fiber, natural fiber and mixtures thereof having a porosity of more than 50%, with a coating, said coating being a porous ceramic coating which is brought onto and into said substrate by applying a suspension and heating one or more times to solidify said suspension on and in said substrate, said suspension comprising at least one oxide of a metal selected from the group consisting of Al, Zr, Si, Ti, Y and mixtures thereof and a sol.

Claim 12 (Original): The process of claim 11, wherein said suspension is brought onto and into said substrate by printing on, pressing on, pressing in, rolling on, knifecoating on, spreadcoating on, dipping, spraying or pouring on.

Claim 13 (Canceled).

Claim 14 (Previously Presented): The process of claim 11, wherein said suspension comprises at least one metal oxide sol, at least one semimetal oxide sol or at least one mixed metal oxide sol or a mixture thereof and is prepared by suspending at least one inorganic component in at least one of these sols.

Claim 15 (Original): The process of claim 14, wherein said sols are obtained by hydrolyzing at least one metal compound, at least one semimetal compound or at least one mixed metal compound using water or an acid or a combination thereof.

Claim 16 (Previously Presented): The process of claim 14, wherein said sol comprises less than 50% by weight of water and/or acid.

Claim 17 (Previously Presented): The process of claim 15, wherein said metal compound hydrolyzed is at least one metal alkoxide compound or at least one semimetal alkoxide compound selected from alkoxide compounds of the elements selected from the group consisting of Zr, Al, Si, Ti, Y and mixtures thereof or at least one metal nitrate, metal carbonate or metal halide selected from metal salts of the elements selected from the group consisting of Zr, Al, Si, Ti, Y and mixtures thereof .

Claim 18 (Previously Presented): The process of claim 14, wherein said inorganic component suspended is at least one oxide selected from the oxides of the elements selected from the group consisting of Y, Zr, Al, Si, Ti and mixtures thereof.

Claim 19 (Previously Presented): The process of claim 11, wherein the mass fraction of said suspended component is from 0.1 to 500 times that of the sol used.

Claim 20 (Previously Presented): The process of claim 11, further comprising adding an adhesion promoter to said suspension.

Claim 21 (Previously Presented): The process of claim 11, further comprising adding an adhesion promoter on said fibers prior to said applying of said suspension.

Claim 22 (Previously Presented): The process of claim 20, wherein said adhesion promoter is selected from the organofunctional silanes and/or the oxides of the elements selected from the group consisting of Zr, Al, Si, Ti and mixtures thereof.

Claim 23 (Canceled).

Claim 24 (Previously Presented): The process of claim 11, wherein said suspension present on and in the support is solidified by heating at from 50 to 350°C.

Claim 25 (Original): The process of claim 24, wherein said heating is effected at from 110 to 280°C for from 0.5 to 10 minutes.

Claim 26 (Previously Presented): A method for producing batteries comprising placing a membrane as claimed in claim 1 in a battery as a separator.

Claim 27 (Previously Presented): A method comprising utilizing a membrane as claimed in claim 1 as a carrier for ultra-filtration, nanofiltration, reverse osmosis, gas separation or pervaporation membranes.

Claim 28 (Previously Presented): A method for microfiltration comprising placing a membrane as claimed in claim 1 in a microfiltration device.

Claim 29 (Canceled).

Claim 30 (Previously Presented): The process of claim 15, wherein said sol comprises less than 50% by weight of water and/or acid.

Claim 31 (Previously Presented): The process of claim 21, wherein said adhesion promoter comprises at least one oxide of the elements selected from the group consisting of Zr, Al, Si, Ti and mixtures thereof.

Claim 32 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyacrylonitrile fiber.

Claim 33 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyamide fiber.

Claim 34 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyimide fiber.

Claim 35 (Previously Presented): The membrane of claim 1, wherein the polymer fiber is a polyacrylate fiber.

Claim 36 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is polytetrafluoroethylene fiber.

Claim 37 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is polyester fiber.

Claim 38 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyolefin fiber.

Claim 39 (Canceled).

Claim 40 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is at least one selected from the group consisting of 3-glycidyloxytrimethoxysilane and 3-meth-acryloyloxypropyltrimethoxysilane.

Claims 41-45 (Canceled).

Claim 46 (Previously Presented): The membrane of claim 1, wherein the substrate consists of one nonwoven polymeric fiber.

Claim 47 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is a glycidyloxy-functionalized silane.

Claim 48 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is a methacryloyloxy-functionalized silane.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.